

Herbicide Information

There are three herbicides approved for use in aquatic environments being considered for this project: AquaMaster[®] by Monsanto, Rodeo[®] by DOW Chemical, and HABITAT[®] by BASF. These three herbicides would be used in any application where herbicide is required because all three herbicides have been shown to be effective in the control of Carrizo cane. All three of these herbicides have been in widespread use in the United States and internationally for many years. Many hundreds of thousands of acres have been treated with these products. They are licensed for and have been applied to water, adjacent to water and in other habitats, and have been used in urban areas. These products are routinely used by government agencies and municipalities.

The active ingredient in AquaMaster[®] and Rodeo[®] is glyphosate isopropylamine salt; it is a non-selective aquatic herbicide that controls emerged vegetation in and around bodies of fresh and salt water. AquaMaster[®] and Rodeo[®] are strongly adsorbed to soil particles, which prevent the herbicide from leaching excessively or from being taken up from the soil by non-target plants (The Nature Conservancy 2001a). Glyphosate has not been shown to accumulate in mammals, fish, or birds (Monsanto 2002). The half-life of glyphosate averages 2 months in soil, and in water, it has a half-life of 12 days to 10 weeks. Glyphosate by itself (not including some of its main surfactants) is of relatively low toxicity to birds, mammals, and fish. The Materials Safety Data Sheet (MSDS) for Rodeo[®] indicates that Rodeo[®] may cause eye irritation; is essentially non-toxic to skin or if eaten; does not cause toxicity if inhaled during a brief exposure (minutes); does not cause cancer, birth defects, mutation, or reproductive effects. It is practically non-toxic to aquatic animals, and birds (DOW 2004). AquaMaster[®] requires no special eye protection, skin protection, or respiratory protection when used as recommended and like Rodeo[®], is practically non-toxic (Monsanto, 2005). The labels for these two glyphosate containing herbicides are legal documents and they describe the safety precautions, health test results and ecological effects of these two chemicals (Dow, 2006, Monsanto, 2006). US EPA issued a registration standard for glyphosate in June of 1986. In 1993, the US EPA concluded a Reregistration Eligibility Determination where they weighed human health and ecological risk assessments, laboratory data and anecdotal evidence. The US EPA concluded that glyphosate will not pose unreasonable risks of adverse effects to humans or the environment (US EPA, 1993). It is so safe that it is registered for use on food crops (US EPA, 1993).

HABITAT[®]'s active ingredient is imazapyr, and it controls undesirable emergent and floating vegetation in an around standing and flowing water. It works well in aerial and low-volume foliar hydraulic application methods. HABITAT[®] affects the plant tissue enzyme acetohydroxyacid synthase, which stops the growth of meristematic cells within 10 hours. It is this specialized enzyme system that only plants have that allows the specificity of action. Animals lack this enzyme system and therefore not affected by the chemical mechanism of imazapyr on plants. The herbicide is mobile in all vascular tissues throughout the plant from root to shoot. HABITAT[®] controls over 90 species, including Carrizo cane and salt cedar, and has a half-life in soils ranging from 26 to 143 days (BASF 2005). In particular, a few studies have reported that when imazapyr contacts leguminous vegetation, such as mesquite, it may be actively exuded from the

roots while not affecting the mesquite. This exudate has the ability to move throughout the root zone, and could affect surrounding desirable vegetation if the concentration was high enough (The Nature Conservancy 2001b). In aqueous solutions, imazapyr undergoes photo-degradation with a half-life of 2 days. Imazapyr has a low toxicity to fish, and algae and submerged vegetation are not affected (The Nature Conservancy 2001b). The Materials Safety Data Sheet for HABITAT[®] indicates that HABITAT[®] may cause slight but temporary eye irritation; is relatively non-toxic if eaten and could cause irritation to skin; does not cause toxicity in inhaled during a brief exposure (minutes); does not cause cancer, birth defects, mutation, or reproductive effects. It is practically non-toxic to aquatic animals, and birds (BASF, 2008). The label for HABITAT[®] is a legal document and describes the safety precautions, health test results and ecological effects of the product (BASF, 2004). Imazapyr was originally registered for use on food crops in 1985. In 2006, the US EPA issued a Reregistration Eligibility decision for Imazapyr in which they cited human health and ecological risk assessments, laboratory data, and anecdotal reports. This decision concluded that all risks to workers and humans that came into contact with imazapyr were below the Agency's level of concern and that there were no risks of concern to terrestrial birds, mammals, bees, aquatic invertebrates or fish (US EPA, 2006). Imazapyr is so safe that it is registered for use in bathing areas and on food crops such as corn (US EPA, 2006).

References

BASF. 2004. HABITAT[®] Herbicide Label. BASF Corporation 26 Davis Drive, Research Triangle Park, NC 27709

BASF. 2005. HABITAT[®] Herbicide For Aquatic and Invasive Vegetation Control, Technical Bulletin, 2005 BASF Corporation. 26 Davis Drive, Research Triangle Park, NC 27709 Available online at: http://www.vmanswers.com/lib/PDF/2545021_habitat_tech.pdf. Last accessed 5 May 2008.

BASF. 2008. HABITAT[®] Herbicide MSDS. BASF Corporation 26 Davis Drive, Research Triangle Park, NC 27709

DOW. Agrosiences 2004. Material Safety Data Sheet for Rodeo[®] Herbicide. Dow AgroSciences LLC, Indianapolis, IN 46268

DOW. Agrosiences 2006. Label for Rodeo[®] Herbicide. Dow AgroSciences LLC, Indianapolis, IN 46268

Monsanto. 2002. AquaMaster[™] Herbicide by Monsanto Technical Fact Sheet, January 2002. Monsanto Company, 800 N. Lindbergh Blvd. St. Louis, MO 63167. Available online at: <http://www.monsanto.com/ito/pdfs/aquaFactSheet.pdf>. Last accessed 5 May 2008.

Monsanto. 2005. Material Safety Data Sheet for AquaMaster[™] Monsanto Company, 800 N. Lindbergh Blvd. St. Louis, MO 63167.

Monsanto. 2006. Label for AquaMaster[™] Monsanto Company, 800 N. Lindbergh Blvd. St. Louis, MO 63167

Nature Conservancy, The (TNC). 2001a. Glyphosate – Weed Control Methods Handbook. Available online at: <http://tncweeds.ucdavis.edu/products/handbook/Glyphosate.pdf>. Last accessed 5 May 2008.

NCAP, 1996. Herbicide Fact Sheet: Imazapyr. The Northwest Coalition for Alternatives to Pesticides. 16:3.

Schwarcz, R. W. O. Whetsell, and R.M. Mangano.1983. Quinolinic acid: an endogenous metabolite that produces axon-sparing lesions in rat brain. Science 219:316-318.

Shaner, D. L. and O'Conner, S. L., The Imidazolinone Herbicides, page 208 CRC Press, 1991

TNC. 2001b. Imazapyr – Weed Control Methods Handbook, updated June 2004. Available online at: <http://tncweeds.ucdavis.edu/products/handbook/Imazapyr.pdf>. Last accessed 5 May 2008.

T.R. Roberts & D.H. Hutson. 1998. Metabolic Pathways of agrochemicals – Part one Herbicides and Plant Growth Regulators. Page 366. Royal Society of Chemistry Publishers. Burlington House, Piccadilly, London W1J 0BA

US EPA 1993. Reregistration Eligibility Decision (RED): Glyphosate. United States Environmental Protection Agency, Office of Preventions, Pesticides and Toxic Substances (7508W) EPA 738-R-93-014.

US EPA 2006. Reregistration Eligibility Decision (RED): Imazapyr. United States Environmental Protection Agency, Office of Preventions, Pesticides and Toxic Substances (7508C) EPA 738-R-06-007.

Citations

The citations below are small quotations from larger documents, provided in excerpt form. The original citations given can be used to obtain these articles.

NCAP, 1996. Herbicide Fact Sheet: Imazapyr. The Northwest Coalition for Alternatives to Pesticides. 16:3.

“One of them, quinolinic acid, is also a primary breakdown product in soil.... It is also a neurotoxin, causing nerve lesions and symptoms similar to Huntington’s disease.”

Schwarcz, R. W. O. Whetsell, and R.M. Mangano.1983. Quinolinic acid: an endogenous metabolite that produces axon-sparing lesions in rat brain. Science 219:316-318.

“A current hypothesis links the neuroexcitatory properties of certain acidic amino acids to their ability to cause selective neuronal lesions. Intracerebral injection of the neuroexcitatory tryptophan metabolite, quinolinic acid, has behavioral, neurochemical, and neuropathological consequences reminiscent of those of exogenous excitotoxins, such as kainic and ibotenic acids. Its

qualities as a neurotoxic agent suggest that quinolinic acid should be considered as a possible pathogenic factor in neurodegenerative disorders.

Shaner, D. L. and O'Conner, S. L., The Imidazolinone Herbicides, page 208 CRC Press, 1991

"Microbial degradation under aerobic conditions is the primary degradation mechanism, with a small contribution from photolysis. Conditions which tend to favor microbial activity such as warm, moist soils are also the conditions under which the imidazolinones are most rapidly degraded"